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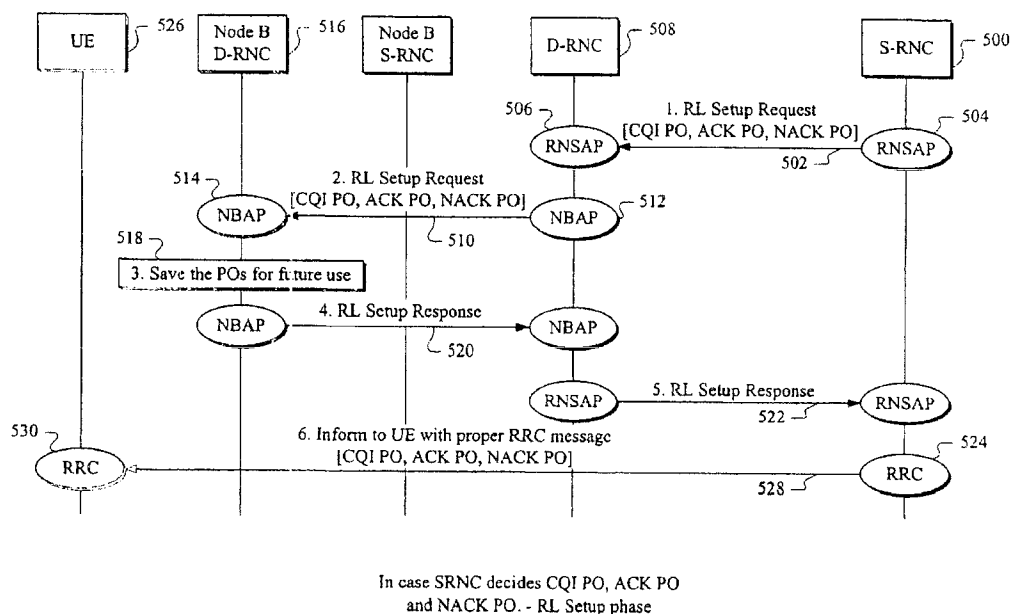
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(54) Title: **HSDPA CQI, ACK, NACK POWER OFFSET KNOWN IN NODE B AND IN SRNC**



(57) Abstract: High speed data packet access (HSDPA) is facilitated by ensuring that power offsets are delivered to the base station (Node B) so that the new functions envisioned therefore having to do with scheduling and retransmission handling can be carried out effectively. A signal primitive having one or more information elements indicative of corresponding power offsets are received by the Node B, saved for future use and then signalled back to the serving radio network controller so that the user equipment can be informed with a proper RRC message containing the appropriate power offsets.

HSDPA CQI, ACK, NACK Power Offset Known In Node B and In SRNC

Background of the Invention

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As an enhancement to the release99/release4 (rel99/rel4) downlink shared channel (DSCH) concept in the third generation partnership project (3GPP) shown in Fig. 1(a) it has been agreed to add a so-called High Speed Downlink Packet Access (HSDPA) concept as a part of the 3GPP rel5 universal terrestrial radio access network (UTRAN) architecture as shown in Fig. 1(b). In Fig. 1(a) the DSCH is transmitted on a downlink Physical Downlink Shared Channel (PDSCH) 10. In principle, the new HSDPA concept of Fig. 1(b) is an enhancement, because the leading idea in 3GPP has been to make HSDPA as an evolution from the shared channel concept not as a revolution. Therefore the defined solutions should resemble as much as possible the solutions which have already been defined for the shared channels. The basic idea behind the HSDPA is to offer a shared high speed channel with a higher data rate and a quick retransmission mechanism (i.e. with HARQ (= Hybrid Automatic Repeat Request)) from Node B. As can be seen by comparing Fig. 1(b) to Fig. 1(a), the Node B is given more intelligence for the purpose of handling retransmissions and scheduling functions, thus reducing the round trip delay between the mobile device and the RNC formerly handling retransmissions in Fig. 1(a). This makes retransmission combining feasible in the mobile device. In place of the variable spreading factor and fast power control used for the DSCH of Fig. 1(a), the HS-DSCH of Fig. 1(b) uses adaptive modulation and coding (AMC) in addition to the HARQ. A much smaller transmission time interval (TTI) of two milliseconds is also used instead of the 10 or 20 milliseconds of the DSCH. Also, the media access control (MAC) is located in the node B instead of the RNC. The AMC part of HSDPA utilizes adaptation of code rate, the modulation scheme, the number of multi-codes employed, as well as the transmit power per code. Even though many parameters are defined in the Radio Network Subsystem Application Part (RNSAP; see 3GPP TS25.423 v5.0.0) and Node B Application Part (NBAP; see 3GPP TS25.433 v5.0.0) to support HSDPA, the HSDPA discussion is on-going in 3GPP and many useful parameters are being added.

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The user equipment is able to send a channel quality indicator (CQI) on the uplink HS-DPCCH (high speed dedicated physical control channel). It indicates the selected transport format resource combination (TFRC) and multi-code number currently supported by the UE.

Fig. 1(c) shows further details of the proposed UTRAN side overall MAC architecture including the new MAC-hs. MAC-hs provides the essential functionalities to support HSDPA. MAC-hs has the scheduling function as well as HARQ.

Currently in 3GPP, the SRNC is supposed to send the CQI Power Offset, ACK Power Offset and NACK Power Offset to the UE via RRC layer messages. Fig. 2 shows a radio interface protocol architecture for HSDPA. The Power Offsets will be defined as relative to the DPCCH pilot bit. Then the UE will use these Power Offsets as follows:

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When an uplink HS-DPCCH is active, the relative power offset $\Delta_{\text{HS-DPCCH}}$ between the DPCCH and the HS-DPCCH for each HS-DPCCH slot shall be set as follows:

For HS-DPCCH slots carrying HARQ Acknowledgement:

- 10 $\Delta_{\text{HS-DPCCH}} = \Delta_{\text{ACK}}$ if the corresponding HARQ Acknowledgement is equal to 1
 $\Delta_{\text{HS-DPCCH}} = \Delta_{\text{NACK}}$ if the corresponding HARQ Acknowledgement is equal to 0

For HS-DPCCH slots carrying CQI:

$$\Delta_{\text{HS-DPCCH}} = \Delta_{\text{CQI}}$$

- 15 The values for Δ_{ACK} , Δ_{NACK} and Δ_{CQI} are set by higher layers (RRC message). The quantization of the power offset can be found in 3GPP TS 25.213 at Table 1A for instance.

Disclosure of Invention

- 20 But in the current 3GPP specification, there is no means to deliver these Power Offsets to Node B. Referring to Figs. 1(c) and Fig. 2, the prior art Node B of Fig. 1(a) did not have the MAC-hs or complementary HS-DSCH FP layers. If Node B were to know the CQI Power offset, which is an object of the present invention, the Node B receiver could utilize this value for scaling the CQI signal. Scaling the CQI signal is related to the signal level setting, and is used
 25 typically in a digital base band implementation, to avoid overflow (i.e. signalling saturation) or underflow (i.e. quantization noise). In ASIC and DSP SW implementations, word length constraints are applied and signals must be scaled accordingly to match with the processing word lengths. If the power offsets for multiple signals are not known by the Node B, as is the case now, signal levels would have to be detected or alternatively in a worst case the Node B
 30 receiver would have to be made available for a possible maximum range of each signal. Especially in this case, both fading on the radio path and adaptation POs extend the required range. Signaling to Node B removes the later proportion for the required range. Therefore, if Node B knows the CQI Power Offset then it simplifies receiver implementation (i.e. when measuring DPCCH power level, CQI power level can be calculated and Node B can adjust
 35 gains in the different parts of receiver in a simple manner).

If Node B knows the ACK Power Offset and the NACK Power Offset, Node B can utilize these values to detect the ACK/NACK signal. For the ACK and NACK detection, the Node B

receiver must also detect the 3rd state, DTX (no signal). This requires setting signal detection thresholds. This detection will be more accurate when it is set based on signaled POs than when it is set based on measured offsets.

- 5 Since ACK/NACK is a level based detection, if Node B already knows the POs of ACK/NACK, it can detect the signal easily.

 If Node B knows the CQI Power Offset it can calculate the CQI power with DPCCH power, Node B doesn't need to measure the offset individually. It can make Node B receiver
10 implementation easier.

 If Power Offsets are not given by signalling, Node B is required to measure these Power Offsets individually. This is similar with beta parameters, which are given for DPCCH and for DPDCH, to indicate power offset between those two dedicated physical channels. Of course, in
15 these schemes, the Node B receiver must still detect the DPCCH level, which is the reference for all the Power Offsets, but it doesn't need to detect other signal levels (CQI's, ACKs & NACKs) individually for all multiple signals and this reduces Node B work significantly.

 Furthermore it is anticipated that giving Power Offsets to the Node B will make the
20 standard further future-proof when supporting some interference cancelling methods.

 Currently, no description can be found from 3GPP specifications or technical reports about this problem and how to solve it. Therefore, there is no prior art recognition of the problem and consequently no solution either. Without knowing the CQI Power Offset, ACK
25 Power Offset and NACK Power Offset, the Node B receiver has to search the signal for whole possible ranges.

 This invention introduces CQI Power Offset, ACK Power Offset and NACK Power Offset on RNSAP and NBAP signalling or HS-DSCH FP.
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 Since the object is for both the UE and Node B to know the same values, there are two possibilities during the RL setup phase:

- (1) SRNC decides the Power Offsets and includes them in the RL SETUP REQUEST
35 message. SRNC also sends the same information to the UE with a proper RRC message.
(2) Node B decides the Power Offsets and includes them in the RL SETUP RESPONSE message. And the SRNC sends the same Power Offsets to the UE with the proper RRC message.

And, there are 3 possibilities to change the POs.

1) SRNC decides to change the Power Offsets and include them in the RL

5 RECONFIGURATION PREPARE message. SRNC also sends the same information to UE with proper RRC message.

2) SRNC decides to change the Power Offsets and include them in the RADIO INTERFACE
PARAMETER UPDATE control frame (It should be noted that the name of the control frame

10 can be different than that). SRNC also sends the same information to UE with proper RRC message.

3) Node B decides to change the Power Offsets. In this case there is no existing mechanism for
Node B to initiate changing the Power Offsets during the connection and there may be a need

15 to define a new procedure. Alternatively, it could be done in such a way that the SRNC initiates Power Offsets change procedure (e.g. SHO case) by sending an RL RECONFIGURATION PREPARE message with HO indication. Then Node B decides new Power Offsets and sends them back in an RL RECONFIGURATION READY message. SRNC also sends the same information to UE with proper RRC message. The RL RECONFIGURATION PREPARE and
20 RL RECONFIGURATION message formats already exist and can be adapted to the purposes of the invention.

Once Node B has the CQI Power Offset, ACK Power Offset and NACK Power Offset, it
will apply CQI Power Offset for CQI slot scaling and ACK Power Offset and NACK Power Offset
25 for ACK and NACK slot detection.

These and other objects, features and advantages of the present invention will become
more apparent in light of the following detailed description of a best mode embodiment thereof,
as illustrated in the accompanying drawing.

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Brief Description of the Drawings

Figure 1: UTRAN side overall MAC architecture showing the defined HSDPA network
architecture in 3GPP. The figure shows a new MAC -hs entity, which is connected, to the MAC
35 -c/sh through lub -interface. The used transport channel under MAC -hs are HS-DSCH, which corresponds in rel99 shared channel concept DSCH transport channel.

Figure 2: Radio Interface Protocol Architecture of HSDPA. The defined protocol stack defines the HS-DSCH FP protocol to provide the HSDPA FP data frames through lub –interface.

Figure 3: UTRAN side MAC architecture / MAC-c/sh details.

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Figure 4: UTRAN side MAC architecture / MAC-hs details.

Figure 5: In case SRNC sets CQI PO, ACK PO and NACK PO – RL Setup Phase.

10 Figure 6: In case Node B sets CQI PO, ACK PO and NACK PO – RL Setup Phase.

Figure 7a: In case SRNC decides to change the values of CQI PO, ACK PO and NACK PO – Using Control Plane protocol.

15 Figure 7b: In case SRNC decides to change the values of CQI PO, ACK PO and NACK PO – Using User Plane protocol.

Figure 8: In case SRNC decides to change the values of CQI PO, ACK PO and NACK PO – Using User Plane protocol – Frame structure.

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Figure 9: In case Node B sets CQI PO, ACK PO and NACK PO – RL Setup Phase.

Best Mode for Carrying Out the Invention

25 Abbreviations

	CRNC	Control RNC (network element)
	DPCCH	Dedicated Physical Control Channel
	DPCH	Dedicated Physical Channel
30	DPDCH	Dedicated Physical Data Channel
	DSCH	Downlink Shared Channel (transport channel)
	FDD	Frequency Division Duplex (operation mode)
	FP	Frame Protocol
	HARQ	Hybrid Automatic Repeat Request (function)
35	HO	Hand Over
	HS-DSCH	High Speed – Dedicated Shared Channel (transport channel)
	HS-PDSCH	Physical Downlink Shared Channel
	HS-SCCH	Shared Control Channel for HS-DSCH

	HS-SICH	Shared Info Channel for HS-DSCH
	HSDPA	High Speed Downlink Packet Access (concept)
	MAC	Medium Access Controller (protocol layer)
	MCS	Modulation and Coding Scheme
5	NBAP	Node B Application Part
	PDSCH	Physical Downlink Shared Channel
	PO	Power Offset
	RL	Radio Link
	RLC	Radio Link Control (protocol layer)
10	RNC	Radio Resource Controller (network element)
	RNSAP	Radio Network Subsystem Application Part
	UE	User Equipment (user device)

The power of the HS-DPCCH is set as a power offset (PO). These POs can be defined
 15 as POs of the DPCH. In detail, they can be defined as PO relative to DPCCH pilot field. In
 addition, to guarantee full cell-coverage a CQI repetition scheme can be used whereby periodic
 CQI's are sent in the uplink HS-DPCCH. Node B then sends user data on the HS-DSCH
 according to its own schedule to the users using time and/or code multiplexing to better utilize
 the available resources also considering UE capability. The Node B prenotifies the UEs of the
 20 transport format and resource combination (TFRC), the multi-code set, as well as the HARQ
 process control on the HS-SCCH two slots in advance of the HS-DSCH. After receiving the
 user data on HS-DSCH, the UE sends a CQI and/or ACK/NACK on the uplink HS-DPCCH as a
 feedback signal after a verification time of several slots. Considering the foregoing, especially
 the new HSDPA-RRM entities (HRQ, packet scheduling, link adaptation) in the Node B, it will
 25 be advantageous for the Node B to know the CQI power offset and the POs of ACK/NACK as
 givens determined either by itself or by the RNSAP/NBAP of the RNC.

As described in the Fig 5 and 6, during the RL Setup phase, there are 2 possibilities for
 accomplishing this end from the outset:

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- (1) SRNC decides CQI PO, ACK PO and NACK PO
- (2) Node B decides CQI PO, ACK PO and NACK PO

In the first case, since SRNC knows the SHO status of UE, based on the SHO situation
 35 it can decide the CQI PO, ACK PO and NACK PO. In this case SRNC will assign these POs in
 the RL Setup Request message during RL setup phase. SRNC will send the same values to
 UE using proper RRC message.

The signalling flow for this example is described in Fig 5. In Fig. 5, a serving radio network controller (S-RNC) 500 provides an RL SETUP REQUEST message as a signal on a line 502 from a radio network subsystem application part (RNSAP) 504 to an RNSAP 506 of a drift radio network controller (D-RNC) 508. The D-RNC 508 processes the RL SETUP REQUEST signal received on the line 502 and provides said RL SETUP REQUEST signal on a line 510 from a Node B application part (NBAP) 512 of the D-RNC 508 to an NBAP 514 of a Node B 516 under D-RNC 508. The RL SETUP REQUEST signal on the line 502 and on the line 510 may include one or more power offset information elements including a CQI PO, an ACK PO and a NACK PO. In that case, the Node B 516 saves the POs for future use as indicated in a step 518. The step 518 should therefore be viewed as also representative of a memory within said Node B. The NBAP of Node B 516 then sends an RL setup response message as a signal on a line 520 to the NBAP of the D-RNC 508. The D-RNC 508 then sends the RL setup response signal on a line 522 from its RNSAP to the RNSAP of the S-RNC 500. A radio resource control (RRC) 524 of the S-RNC 500 then informs a UE 526 with a proper RRC message signal on a line 528 which is received in the corresponding RRC 530 of the UE 526. The RRC message includes the CQI PO, the ACK PO and the NACK PO for use by the UE in sending CQI's, NACK's and ACK's on the HS-DPCCH uplink to the Node B. Since the Node B has saved the POs for future use, and it therefore already knows these POs, it can use them in interpreting the CQI, ACK and NACK information sent by the UE to the Node B without having to be in the dark, so to speak. As can be seen by the illustration of Fig. 1(b) as compared to that of Fig. 1(a), the process is made more efficient. It should be realized that a given S-RNC 500 may be in direct communication with an associated Node B, and therefore the steps shown in Fig. 5 could be carried out without using the D-RNC 508 as an intermediary. For the sake of completeness, however, Fig. 5 shows the possibility of using a D-RNC intermediate between the S-RNC and the Node B. Consequently, the RL setup request signal on the line 502 can be sent directly to the Node B 516 or via the D-RNC 508. Likewise, the signalling descriptions shown in Figs. 6, 7A, 7B and 9 should also be understood in this way for signals both in the direction from the S-RNC toward the Node B and in the reverse direction.

In the second case, referring now to Fig. 6, since Node B knows HSDPA related resource status and can be considered to have better knowledge of HSDPA, it can decide the CQI PO, ACK PO and NACK PO. But in this case Node B doesn't know whether it is in an HO situation or not. Therefore the SRNC has to give the HO Indication. As described in Fig 6, in an RL Setup Request message is sent by an S-RNC 600 by its RNSAP on a line 602 to an RNSAP 604 of a D-RNC 606 and includes an HO Indication. An NBAP 608 of the D-RNC 606 provides an RL SETUP REQUEST message as a signal with the HO indication on a line 610 to an NBAP 612 of a Node B 614 of the D-RNC 606. The Node B 614 then decides the POs based on the HO indication and its own measurements and consequent decisions and saves

the POs for future use as indicated in a step 616. After that, the NBAP of the Node B 614 sends an RL setup response message as a signal with the decided PO information elements on a line 618 to the NBAP of the D-RNC 606. The RNSAP of the D-RNC 606 then sends the RL setup response message on a signal line 620 to the RNSAP of the S-RNC 600. An RRC 622 of the S-RNC 600 then informs a UE 624 by means of a proper RRC primitive message on a signal line 626 including the CQI, ACK and NACK PO information elements to an RRC 628 of the UE 624. The UE then uses the PO information in setting the powers of the various CQI, ACK or NACK slots of its HS-DPCCH.

And if SRNC is the node to change the Power Offset values then it can use the Synchronised RL Reconfiguration Procedure as described in Fig 7a to change the POs, once established. One example of this case can be the soft handover (SHO) situation. In an RL Reconfiguration Preparation message on a signal line 7a2, an RNSAP 7a4 of an SRNC 7a6 can include new CQI PO or/and ACK PO or/and NACK PO or/and and a Node B 7a8 shall apply these new values. And if Node B can use the values it will reply with an RL Reconfiguration Ready primitive message on a line 7a10 as a positive ACK. If Node B cannot use the values, then it will reply with RL Reconfiguration Failure message. In case of SRNC determination of Power Offsets, to change the POs, it is also possible to use a user plane Frame Protocol (FP) as described in Fig 7b. In this case, in the FP, a proper control frame should be defined or used. For instance like in the DCH FP, it is desirable to define a Radio Interface Parameter Update control frame and deliver these POs in this control frame as shown for instance on a line 7b10 from an HS-DSCH FP 7b12 of an S-RNC 7b14. An example of such a frame structure is depicted in Fig 8. The name of the control frame or the order of the fields can of course be different than that shown in Fig. 8. The important point here is these Power Offsets can be delivered by a UP control frame. In Fig 8, the flag points to whether the corresponding Power Offsets are valid data or not. In the example, Flag bit 1 indicates CQI PO, bit2 ACK PO and bit3 NACK PO. If the flag is 1 then the corresponding PO value is valid. Compared to using the control plane, using the user plane is a rather lighter solution. But in the case of using the user plane, the delivery cannot be guaranteed (No response message). Therefore repeatedly sending the same control frame multiple times can be an option. This can make Node B receive the POs with higher probability.

If Node B is the node to change these POs and Node B is the node to initiate a PO change procedure, a new message is needed to be defined from Node B to SRNC so that the new message can include new POs. After receiving new POs, SRNC will forward these new POs to the UE. But if Node B is the node to change these POs and SRNC is the node to initiate the PO change procedure (e.g. SRNC changes the POs during SHO), Synchronised RL Reconfiguration Procedure can be used as describe in Fig 9. SRNC 900 sends the RL

Reconfiguration Prepare message from an RNSAP 902 on a line 904 to an RNSAP 906 of a D-RNC 908 with HO Indicator, and then an NBAP 910 of a Node B 912 receives the HO indication on a line 914 from an NBAP 916 of the D-RNC 908 and decides 918 new POs and sends them back from the NBAP 910 to DRNC in an RL Reconfiguration Ready message 920. After
5 receiving same from the D-RNC RNSAP, the SRNC forward those POs to the UE on a line 930 using a proper RRC message. And this whole procedure can be implemented in FP (Frame Protocol). I.e., SRNC can give the HO indication by control frame in FP and Node B will provide CQI PO, ACK PO and NACK PO in a control frame in FP. And also Node B can provide CQI PO, ACK PO and NACK PO with this control frame without SRNC's request.

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When HSDPA is implemented CQI Power Offset, ACK Power Offset and NACK Power Offset signalling will be implemented as defined in the specification. During HSDPA service, always UE and Node B shall have same Power Offset (CQI, ACK and NACK) values. Therefore whenever HSDPA is implemented, this feature should be implemented.

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Although the invention has been shown and described with respect to a best mode embodiment thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omissions and additions in the form and detail thereof may be made therein without departing from the spirit and scope of the invention.

CLAIMS

1. Method for execution in a radio access network (RAN), comprising the steps of:
receiving by a base station (Node B) of said RAN a radio link (RL) setup request
5 signal from a serving radio network controller (S-RNC), said signal having one or more
information elements (IEs) indicative of one or more corresponding power offsets
(POs), and
saving said one or more POs in said Node B, and sending from said Node B an
RL setup response signal to said S-RNC with IEs indicating receipt of said one or more
10 POs from said S-RNC.
2. The method of claim 1, wherein said RL setup request signal includes a
handover (HO) indication instead of said IEs and wherein said method further
comprises the step of said Node B determining said one or more IEs and then carrying
15 out said step of saving said one or more POs in said Node B and sending from said
Node B an RL setup response signal to said S-RNC indicating said one or more POs
determined by said Node B.
3. The method of claim 1, further comprising the steps of:
20 sending from said S-RNC said RL setup request signal to a drift radio network
controller (D-RNC) associated with said Node B, and
sending said RL setup request signal from said D-RNC to said Node B.
4. The method of claim 3, further comprising the step of sending a radio resource
25 controller (RRC) message signal from said S-RNC to a user equipment (UE) indicative
of said one or more IEs sent to or received from said Node B.
5. The method of claim 4, wherein said RRC message signal is sent from said S-
RNC to said UE .
- 30 6. The method of claim 1, further comprising the step of sending a radio resource
controller (RRC) message signal from said S-RNC to a user equipment (UE) indicative
of said one or more IEs sent to said Node B.

7. The method of claim 6, wherein said RRC message signal is sent from said S-RNC to said UE.

8. The method of claim 1, wherein said IEs include an IE indicative of power offset used in an uplink (UL) between a high speed dedicated physical control channel (HS-DPCCH) slot carrying hybrid automatic repeat request (H-ARQ) information and an associated dedicated physical control channel (DPCCH).

9. The method of claim 8, wherein said H-ARQ information is H-ARQ acknowledge (ACK) information.

10. The method of claim 1, wherein said IEs include an IE having a channel quality indicator (CQI) indicative of power offset used in an uplink (UL) between an HS-DPCCH slot carrying CQI information and said associated DPCCH.

15

11. The method of claim 3, further comprising the steps of:

receiving a RL reconfiguration prepare message signal according to a control plane protocol from said S-RNC at said Node B directly or via said D-RNC with changes to said one or more IEs,

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changing one or more corresponding POs at said Node B, and

sending an RL reconfiguration ready message signal according to said control plane protocol from said Node B to said S-RNC directly or via said D-RNC.

12. The method of claim 11, further comprising the steps of:

25

sending from said S-RNC said RL reconfiguration prepare message signal to said Node B directly or via said D-RNC, and

sending an RRC message signal from said S-RNC to a user equipment (UE) indicative of said one or more IEs sent to said Node B.

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13. The method of claim 3, further comprising the steps of:

receiving a radio interface parameter update signal according to a user plane protocol directly from said S-RNC at said Node B or via said D-RNC with changes to said one or more IEs, and

changing one or more corresponding POs at said Node B.

35

14. The method of claim 13, further comprising the steps of:

sending from said S-RNC said radio interface parameter update signal directly to said Node B or via said D-RNC, and

5 sending an RRC message signal from said S-RNC to a user equipment (UE) indicative of said update signal sent to said Node B.

15. Method, comprising the steps of:

10 sending a radio link (RL) setup request signal from a radio network subsystem application part from a serving radio network controller (S-RNC) to a radio network subsystem application part (RNSAP) of a drift radio network controller (D-RNC) using radio network layer signaling procedures (RNSAP) specified for use between two radio network controllers, said RL setup request signal including one or more information elements indicative of power offsets (PO) including at least one of a channel quality indicator (CQI) PO, an acknowledge (ACK) PO and a negative acknowledge (NACK) PO,

15 sending said radio link setup request signal from a Node B application part (NBAP) of said D-RNC to an NBAP of a Node B associated with said D-RNC for future use by said Node B,

20 sending a radio link setup response signal from said NBAP of said Node B to said NBAP of said D-RNC indicative of receipt of said RL setup request signal by said NBAP of said Node B,

sending said radio link setup response signal from said RNSAP of said D-RNC to said RNSAP of said S-RNC, and

25 sending a radio resource controller (RRC) message signal from said S-RNC to a user equipment indicative of said one or more information elements.

16. Apparatus for use in a radio access network (RAN), comprising:

30 an application part (514) of a base station (Node B) of said RAN, responsive to a radio link (RL) setup request signal (510) received via a drift radio network controller (D-RNC) associated with said Node B or directly from a serving radio network controller (S-RNC), said signal having one or more information elements (IEs) indicative of one or more corresponding power offsets (POs); and

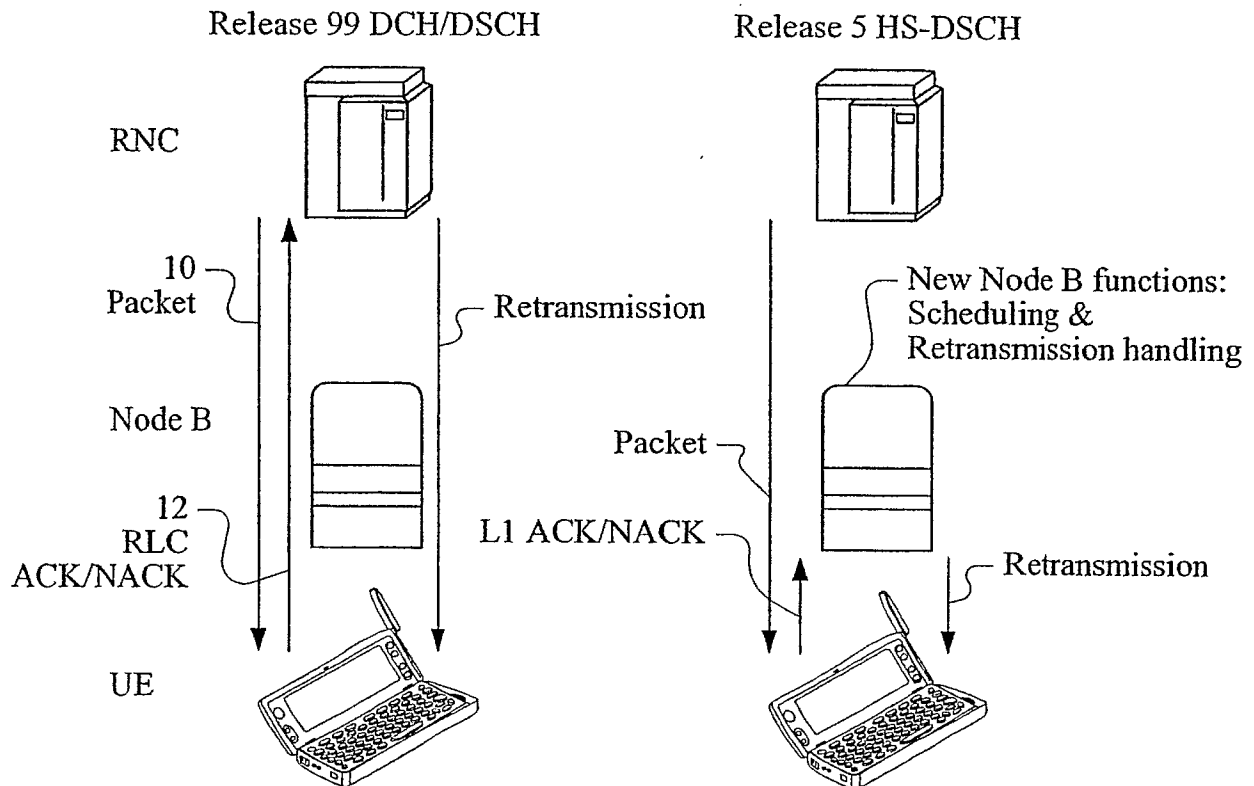
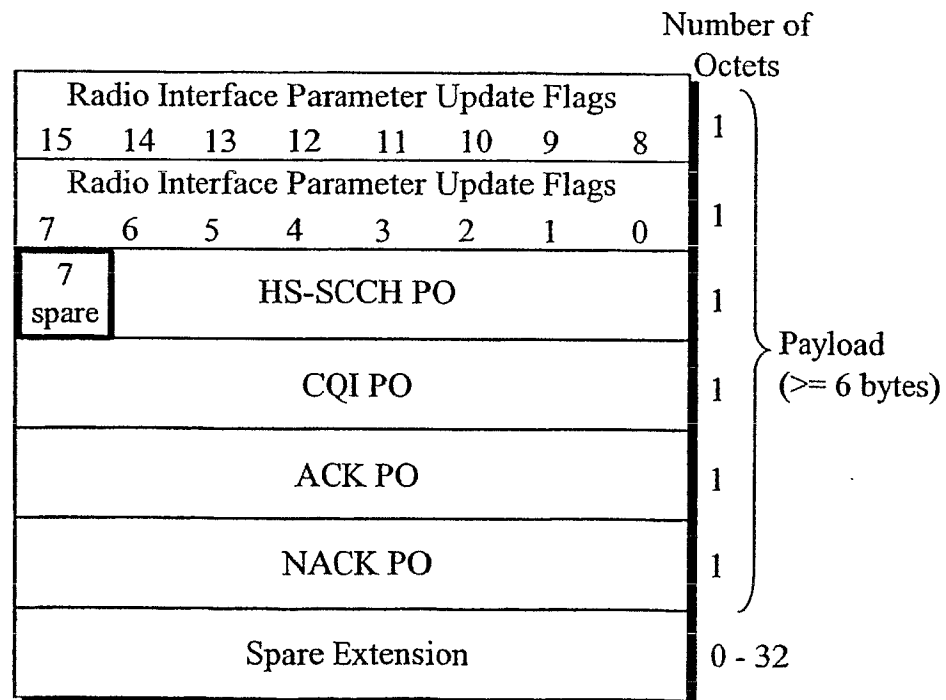
a memory (518) in said Node B for storing said one or more POs in said Node B, said application part for sending from said Node B an RL setup response signal to said

S-RNC directly or via said D-RNC for indicating receipt of said one or more POs from said S-RNC.

17. The apparatus of claim 16, wherein said RL setup request signal includes a
5 handover (HO) indication instead of said IEs and wherein said Node B includes means for determining said one or more POs and for storing said one or more POs in said memory and for sending an RL setup response signal to said S-RNC indicating said one or more Pos determined by said Node B.
18. The apparatus of claim 16, wherein said S-RNC is for sending a radio resource
10 controller (RRC) message signal to a user equipment (UE) indicative of said one or more IEs sent to or received from said Node B.
19. The apparatus of claim 16, wherein said IEs include an IE indicative of power
15 offset used in an uplink (UL) between a high speed dedicated physical control channel (HS-DPCCH) slot carrying hybrid automatic repeat request (H-ARQ) information and an associated dedicated physical control channel (DPCCH).
20. The apparatus of claim 19, wherein said H-ARQ information is H-ARQ
20 acknowledge (ACK) information.
21. The method of claim 16, wherein said IEs include an IE having a channel quality
indicator (CQI) indicative of power offset used in an uplink (UL) between an HS-DPCCH
25 slot carrying CQI information and said associated DPCCH.
22. The apparatus of claim 16, wherein:
said Node B is responsive to a RL reconfiguration prepare message signal
according to a control plane protocol from said S-RNC directly or via said D-RNC with
30 changes to said one or more IEs, for changing one or more corresponding POs at said Node B, and for sending an RL reconfiguration ready message signal according to said control plane protocol from said Node B to said S-RNC directly or via said D-RNC.

23. The apparatus of claim 22, wherein said S-RNC is also for sending an RRC message signal to a user equipment (UE) indicative of said one or more IEs sent to said Node B.
- 5 24. The apparatus of claim 16, wherein a radio interface parameter update signal according to a user plane protocol is received from said S-RNC at said Node B directly or via said D-RNC with changes to said one or more IEs, and, in response thereto, said Node B changes one or more corresponding POs.
- 10 25. The apparatus of claim 24, wherein said S-RNC sends said radio interface parameter update signal to said Node B directly or via said D-RNC, and also sends an RRC message signal to a user equipment (UE) indicative of said update signal sent to said Node B.
- 15 26. System, comprising:
a serving radio network controller (S-RNC) for sending a radio link (RL) setup request signal from a radio network subsystem application part (RNSAP) thereof to
a RNSAP of a drift radio network controller (D-RNC) using radio network layer signaling procedures specified for use between two radio network controllers, said RL
20 setup request signal including one or more information elements indicative of power offsets (PO) including at least one of a channel quality indicator (CQI) PO, an acknowledge (ACK) PO and a negative acknowledge (NACK) PO,
said D-RNC having a Node B application part (NBAP) for sending said radio link setup request signal to
25 an NBAP of a Node B associated with said D-RNC for future use by said Node B, wherein said NBAP of said Node B is for sending a radio link setup response signal to said NBAP of said D-RNC indicative of receipt of said RL setup request signal by said NBAP of said Node B, wherein said RNSAP of said D-RNC is for sending said radio link setup response signal to said RNSAP of said S-RNC via said RNSAP of said
30 D-RNC, and
wherein said S-RNC is for sending a radio resource controller (RRC) message signal to a user equipment (UE) indicative of said one or more information elements.
27. A computer program product for at least temporary storage in a computer
35 readable medium for executing the steps of claim 1.

28. A data structure including a plurality of primitives, each primitive for at least temporary storage in a computer-readable medium at a base station (Node B) and in a computer readable medium at a server (RNC) during transfer of said primitives over a network between the base station and the server, characterized in that
- the data structure includes a radio link reconfiguration prepare primitive provided from said server to said base station including at least one power offset information element or at least a handover indication, and that in case said handover indication is provided to said base station, and that said data structure includes a radio link set up response primitive from said base station to said server with information elements indicating either said at least one power offset determined by said base station or indicating receipt by said base station of said at least one power offset from said server.

**FIG. 1(a)****FIG. 1(b)****FIG. 8**

In case SRNC decides to change the values of CQI PO, ACK PO and NACK PO. - Using User Plane protocol - Frame structure

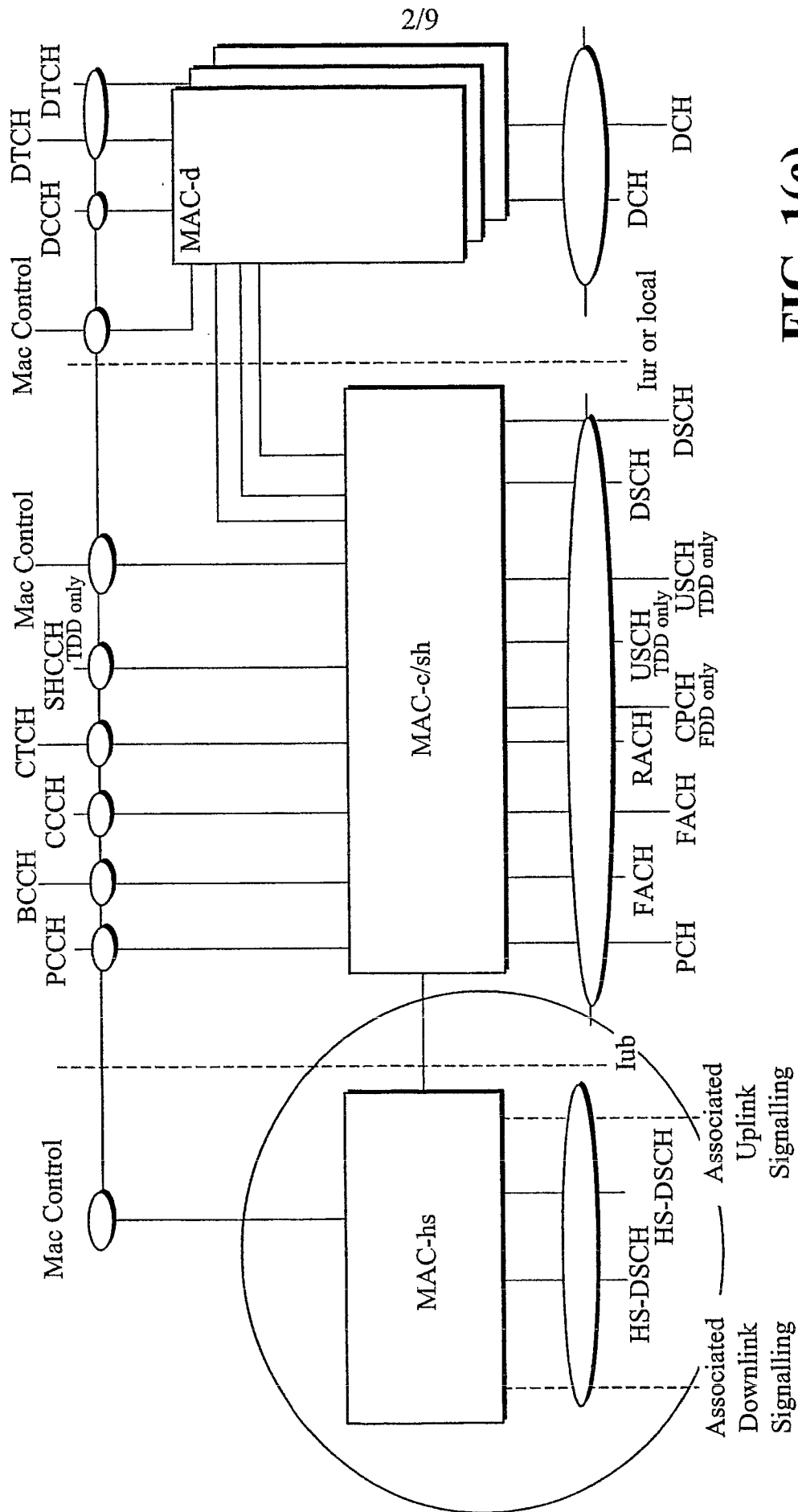
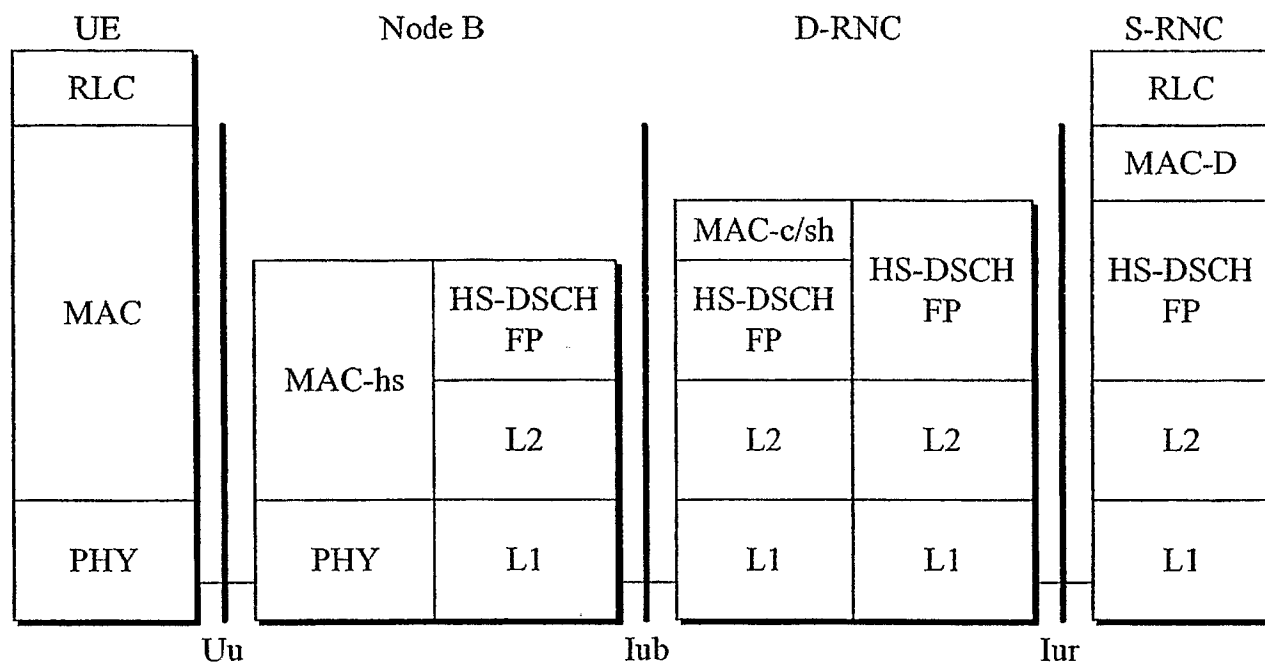
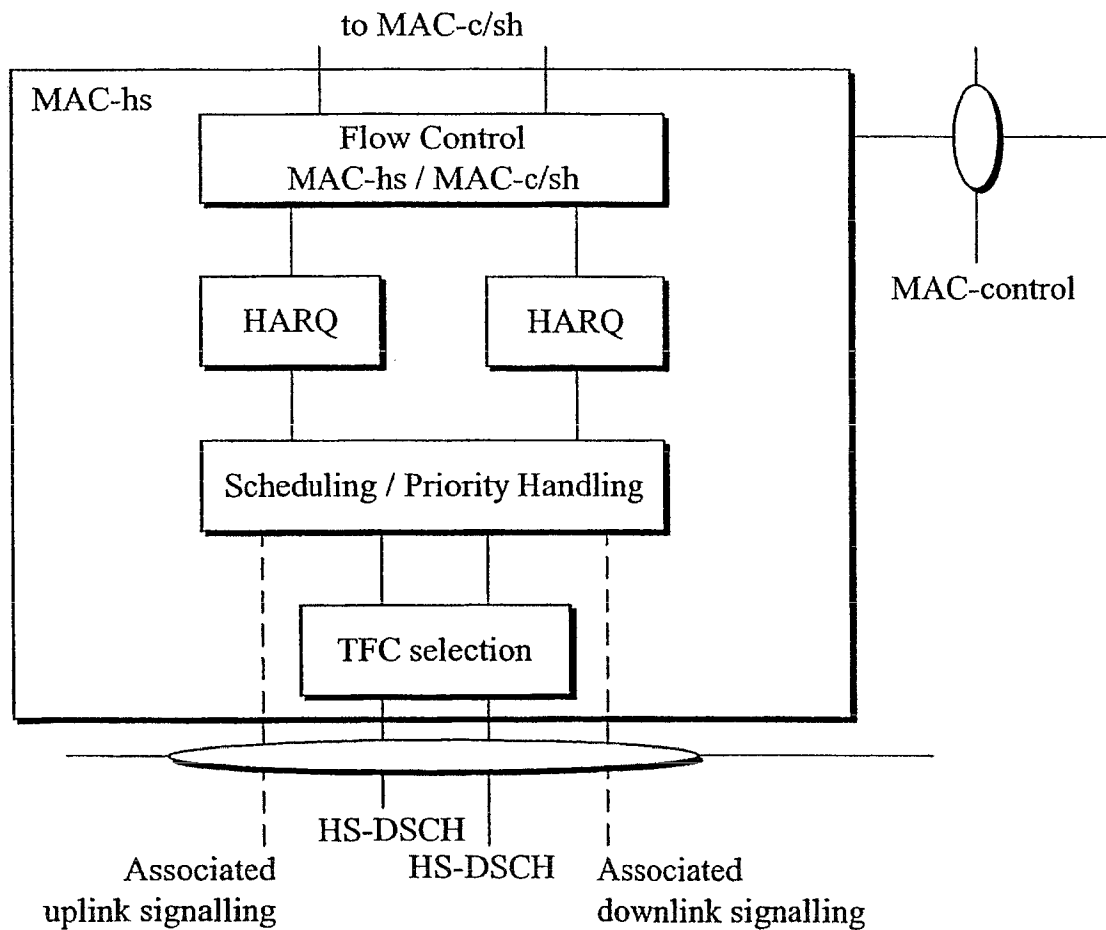


FIG. 1(c)

UTRAN side overall
MAC architecture

**FIG. 2**

Radio Interface Protocol Architecture of HSDPA

**FIG. 4**

UTRAN side MAC architecture / MAC-hs details

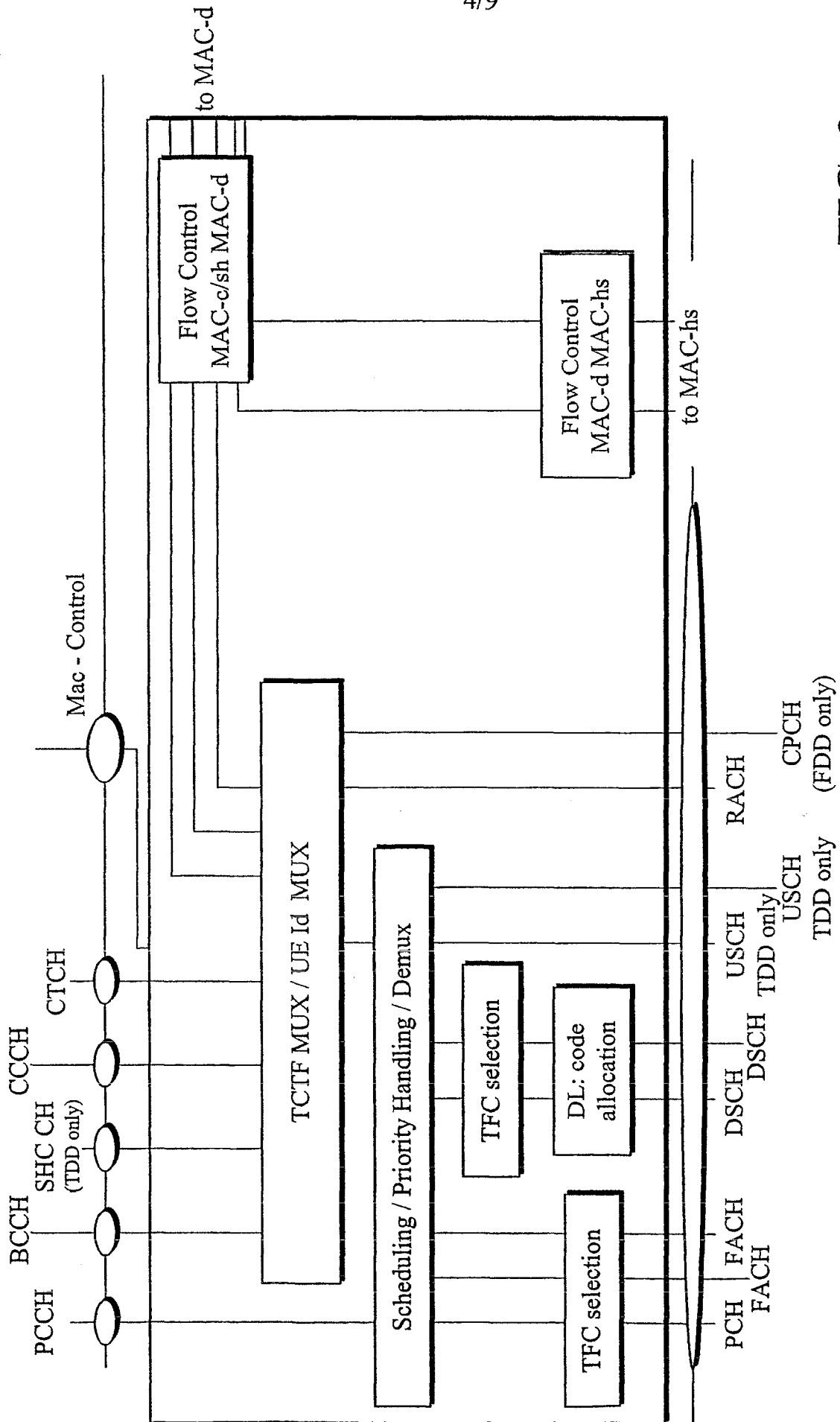


FIG. 3

UTRAN side MAC architecture /
MAC-c/sh details

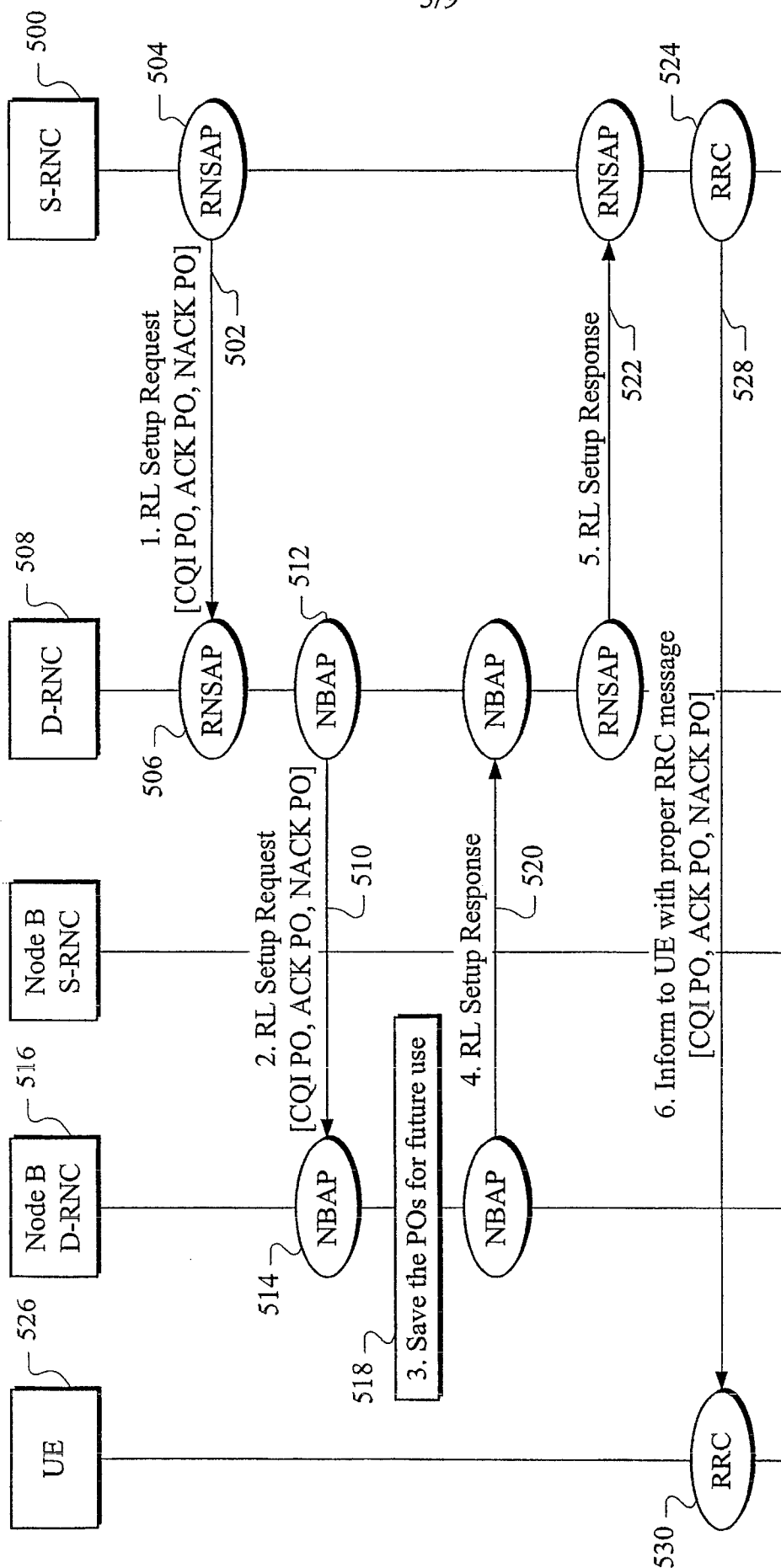


FIG. 5

In case SRNC decides CQI PO, ACK PO and NACK PO. - RL Setup phase

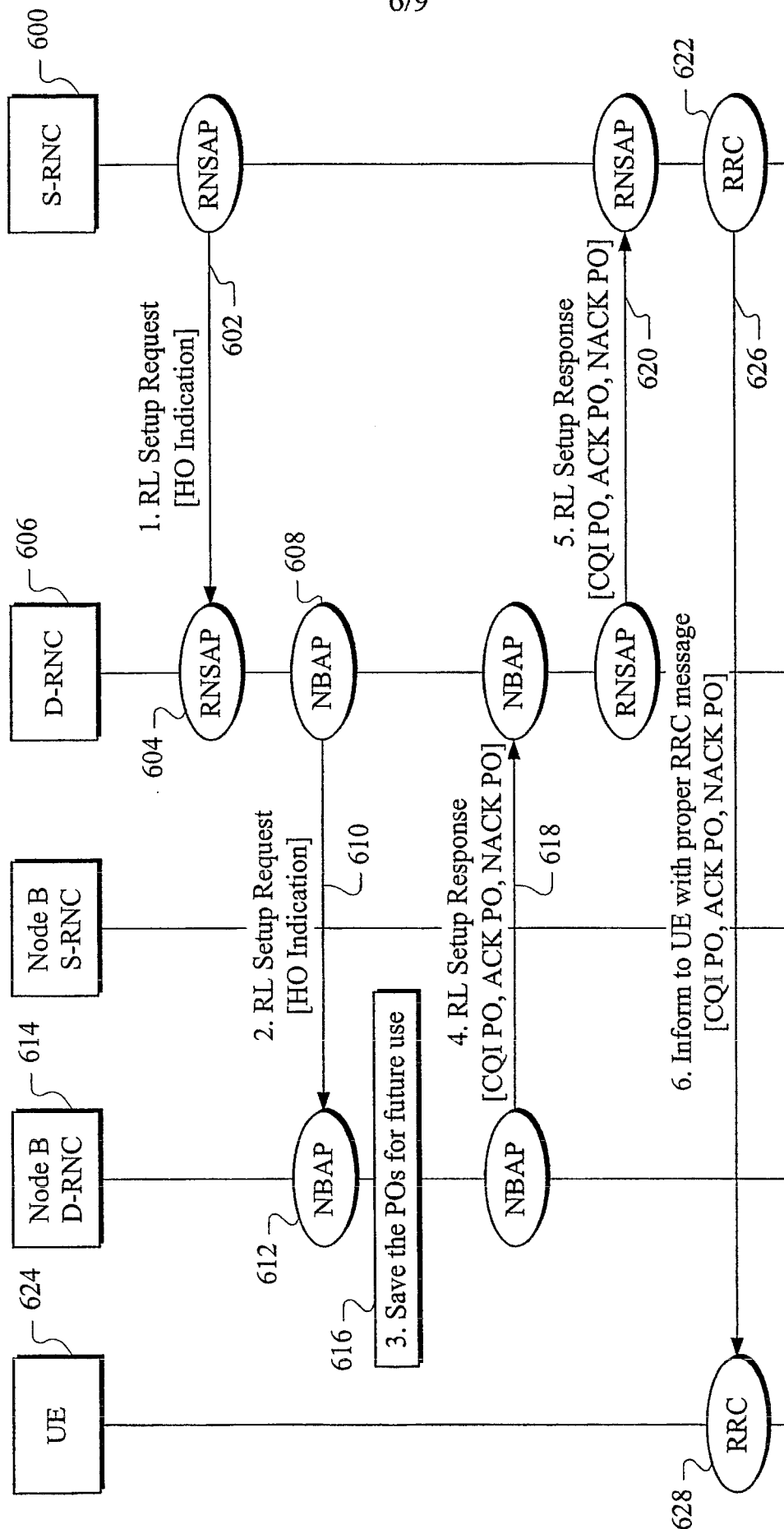


FIG. 6

In case Node B decides CQI PO, ACK PO and NACK PO. - RL Setup phase

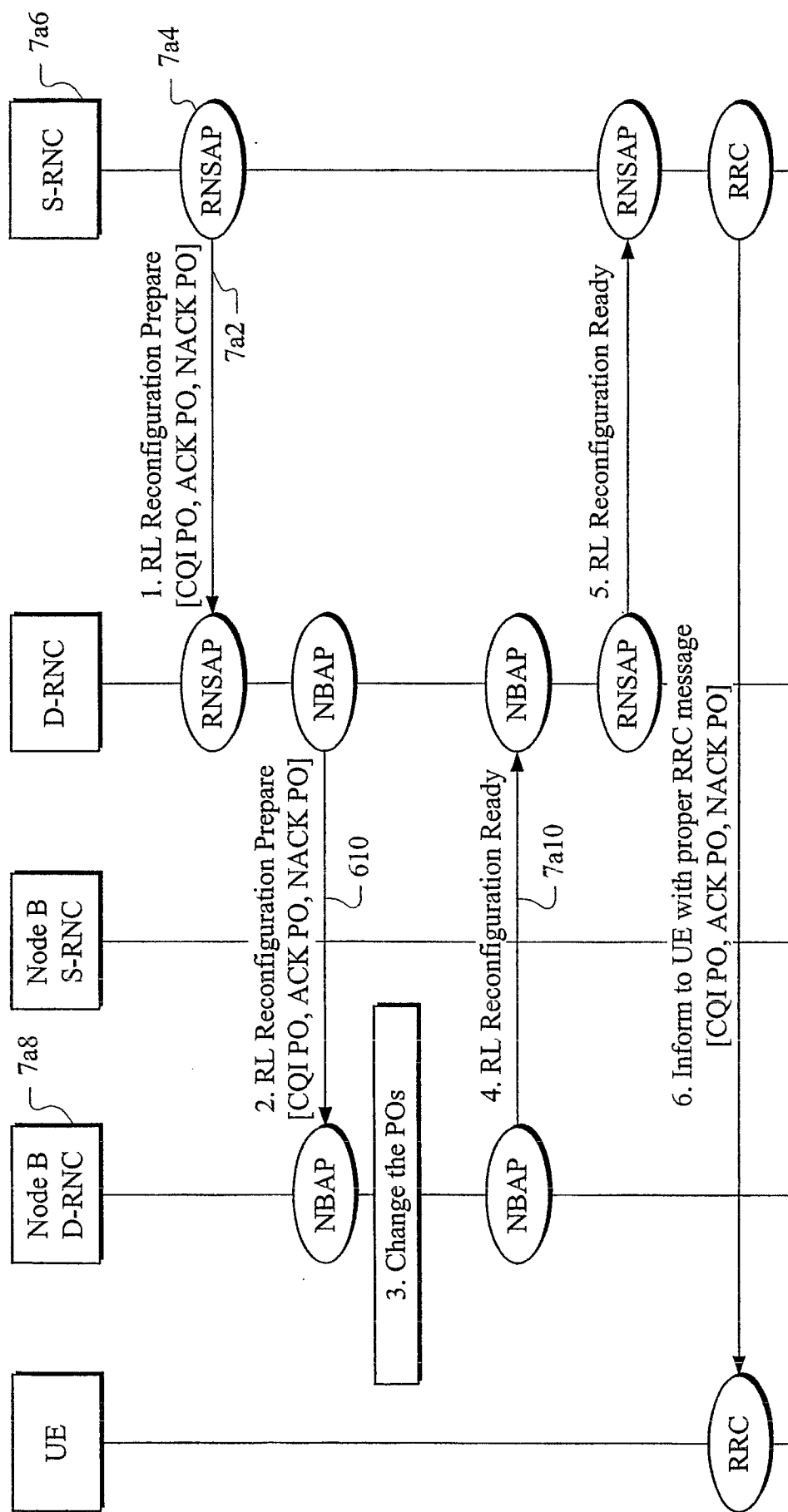


FIG. 7a

In case SRNC decides to change the values of CQI PO, ACK PO and NACK PO - Using Control Plane protocol

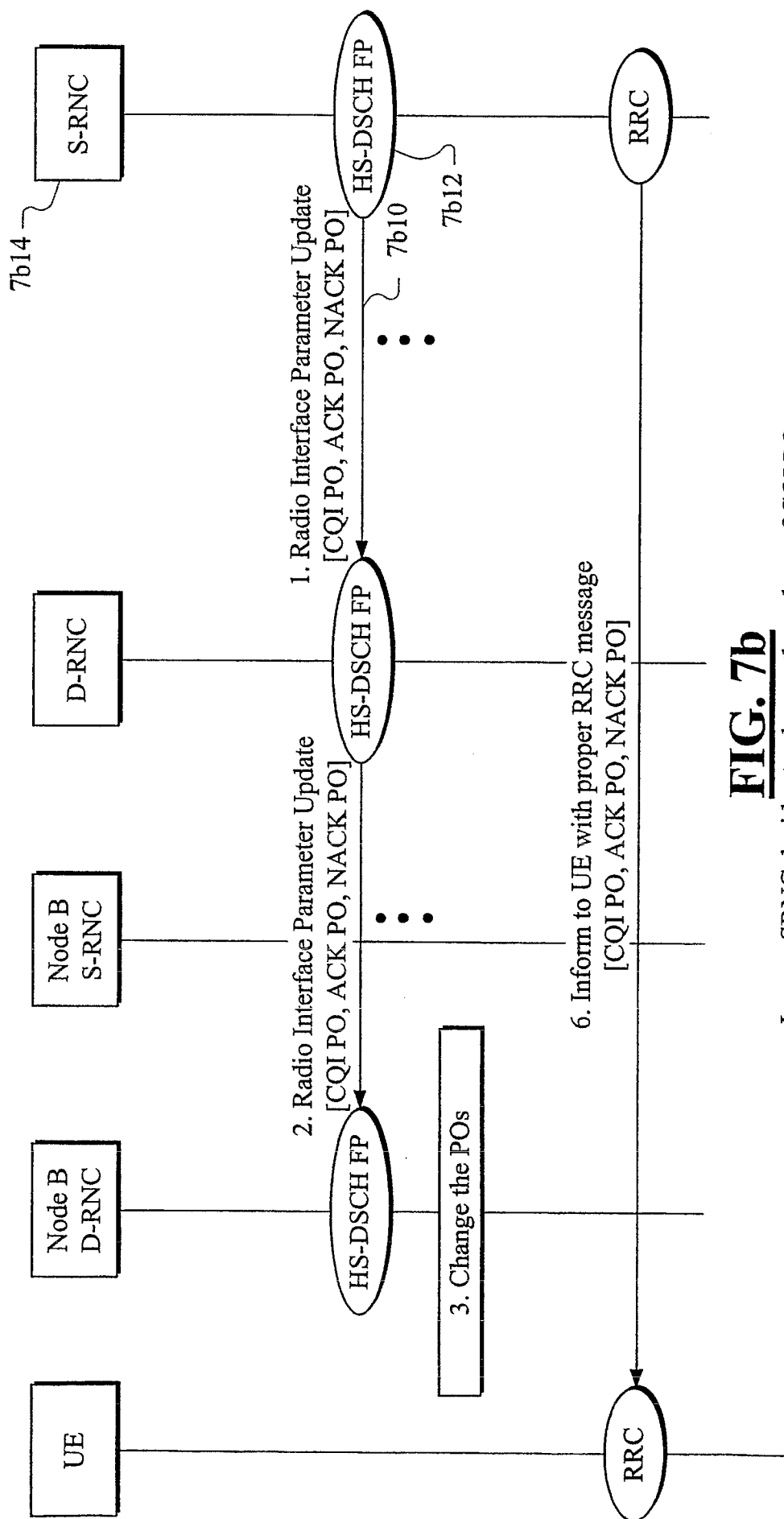


FIG. 7b

In case SRNC decides to change the values of CQI PO, ACK PO and NACK PO - Using User Plane protocol

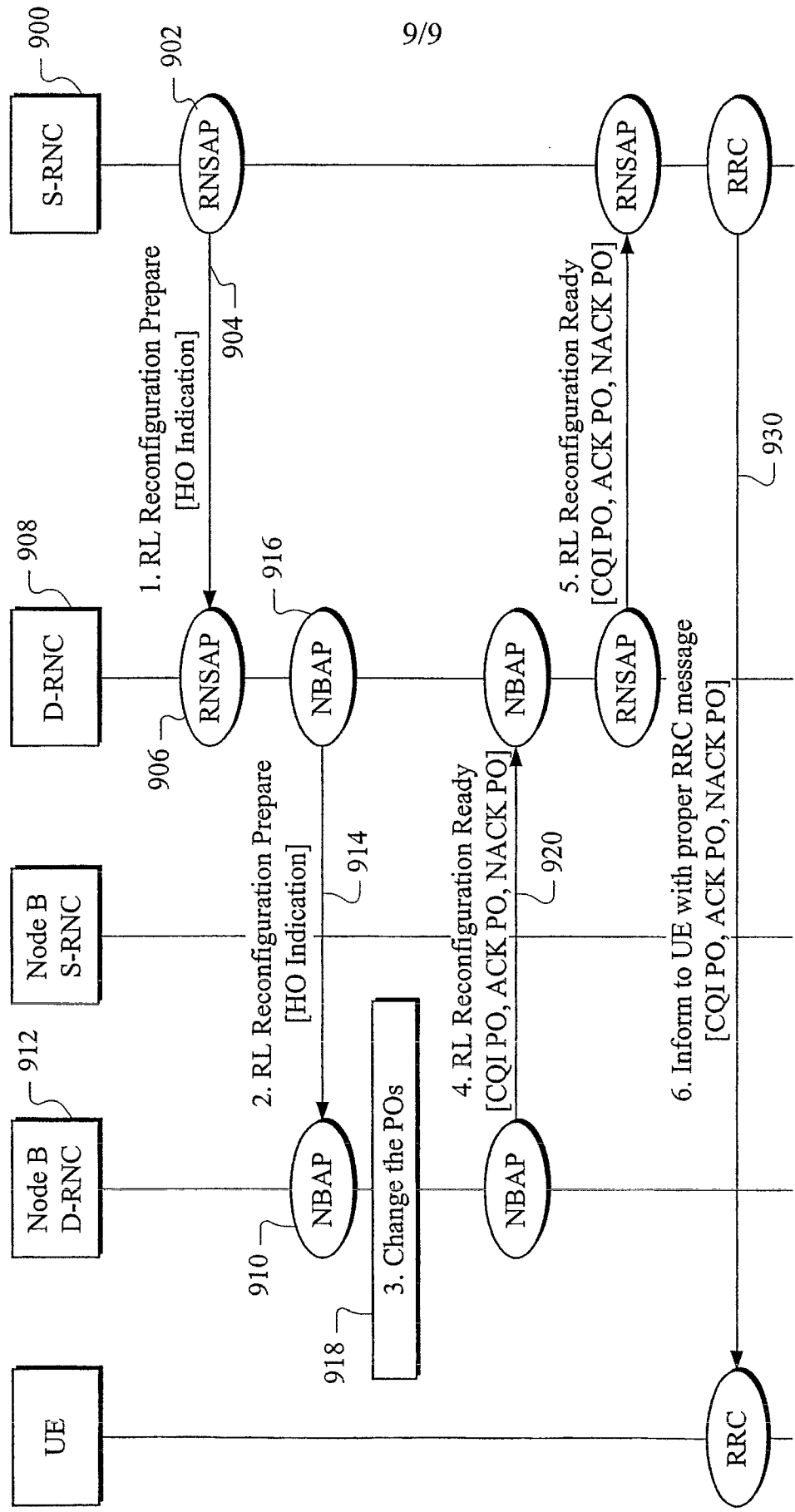


FIG. 9

In case Node B decides CQI PO, ACK PO and NACK PO.

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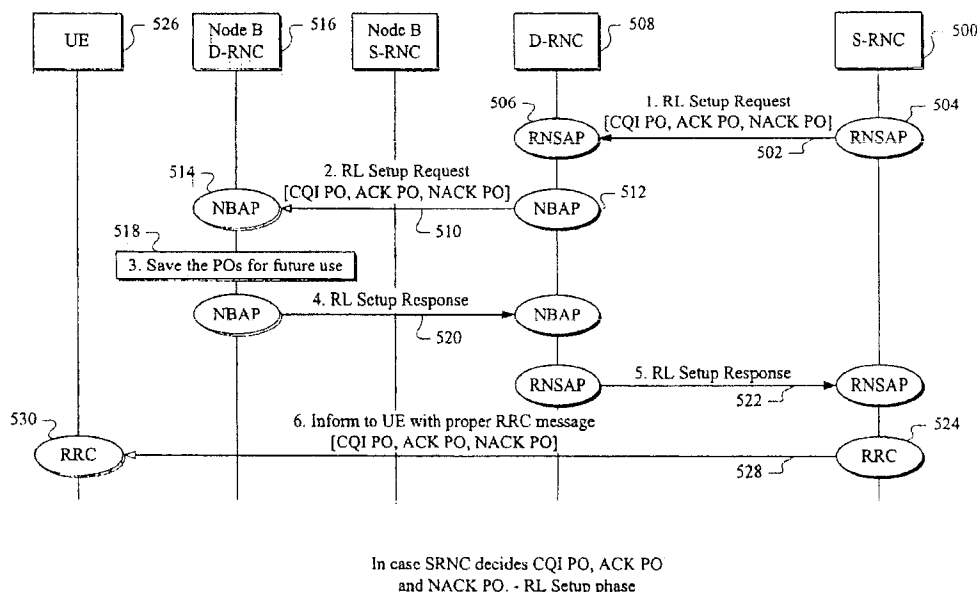
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(54) Title: **HSDPA CQI, ACK, NACK POWER OFFSET KNOWN IN NODE B AND IN SRNC**



(57) Abstract: High speed data packet access (HSDPA) is facilitated by ensuring that power offsets are delivered to the base station (Node B) so that the new functions envisioned therefor having to do with scheduling and retransmission handling can be carried out effectively. A signal primitive having one or more information elements indicative of corresponding power offsets are received by the Node B, saved for future use and then signalled back to the serving radio network controller so that the user equipment can be informed with a proper RRC message containing the appropriate power offsets.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : H04Q 7/20 US CL : 455/445, 69, 522, 439, 435 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 455/445, 69, 522, 439, 435 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 6,389,265 B1 (JESCHKE et al) 14 May 2002 (14.05.2002), column 2, line 17 to column 5, line 57	1-28
Y,E	US 6,618,589 B1 (RUNE et al) 09 September 2003 (09.09.2003), column 1, line 20 to column 9, line 28	1-28
Y	US 6,085,108 A (KNUTSSON et al) 04 July 2000 (04.07.2000), column 6, line 65 to column 10, line 37	1-28
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